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Stack et al.

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(54) **CABLE HARNESS ASSEMBLY WITH A SHIELDED TWISTED PAIR CABLE**

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H01B 7/00	(2006.01)
H01R 9/05	(2006.01)

(52) **U.S. Cl.**

CPC ***H01B 7/0045*** (2013.01); ***H01B 11/08*** (2013.01); ***H01R 9/0518*** (2013.01); ***H01R 13/6581*** (2013.01)

(58) **Field of Classification Search**

CPC H01B 7/0045; H01B 11/08; H01R 9/0518; H01R 13/6581

USPC ..... 174/72 A

See application file for complete search history.

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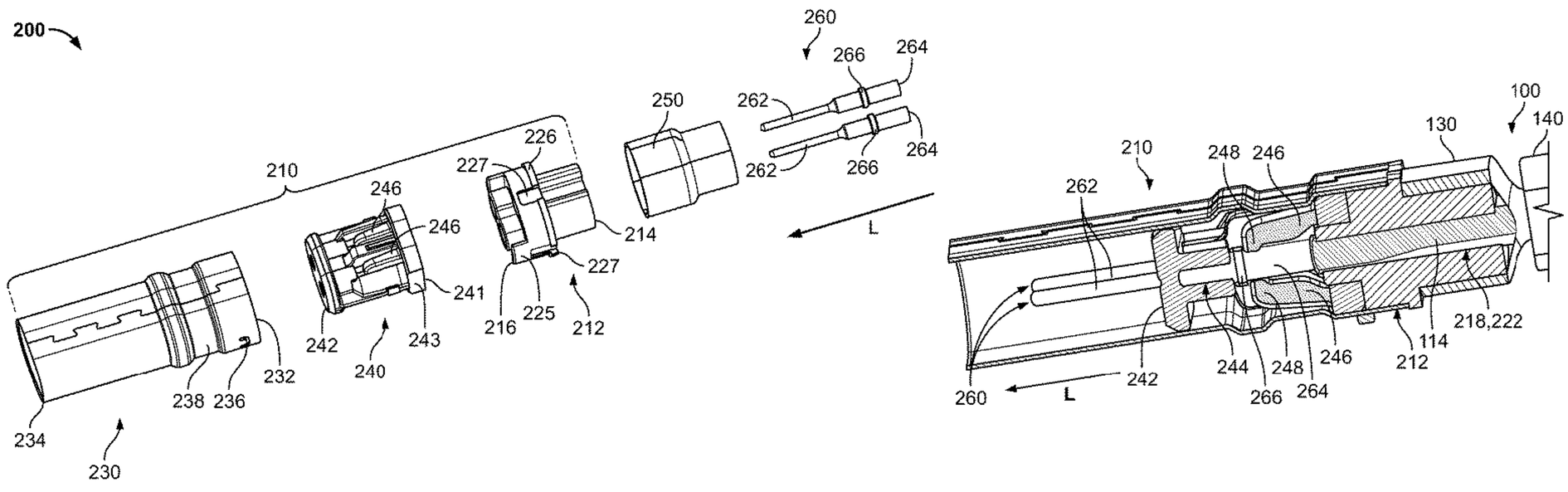
(57) **ABSTRACT**

A cable harness assembly includes a cable having a pair of wires and a connector assembly including an inner ferrule formed of a conductive material. Each of the wires has a conductor and a insulation disposed around the conductor. The pair of wires have a twisted region and an untwisted region. The inner ferrule has a cable passageway extending through the inner ferrule and a separator disposed within the cable passageway. The untwisted region is disposed in the inner ferrule and the separator is disposed between the wires in the untwisted region.

29 Claims, 9 Drawing Sheets



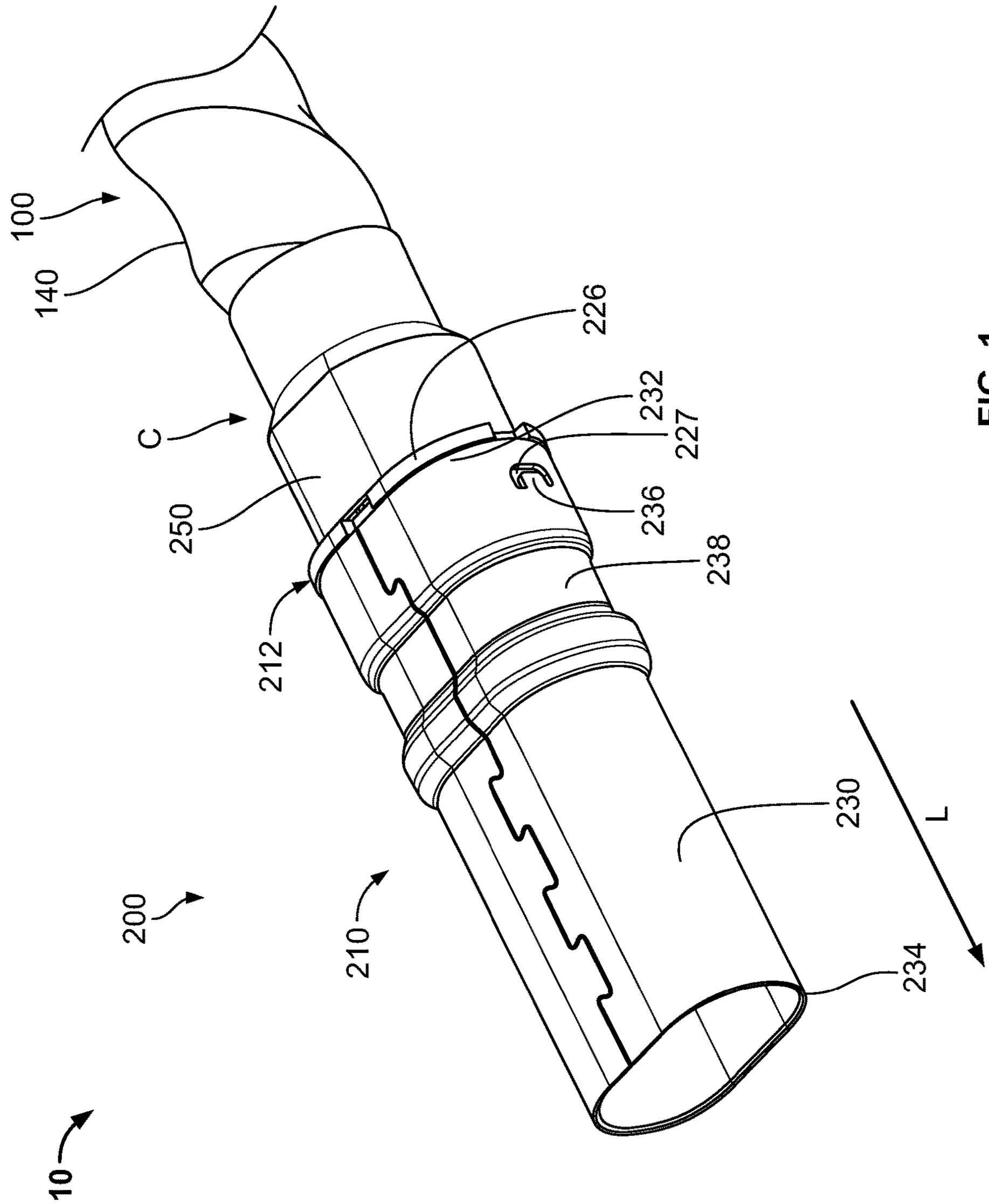


FIG. 1

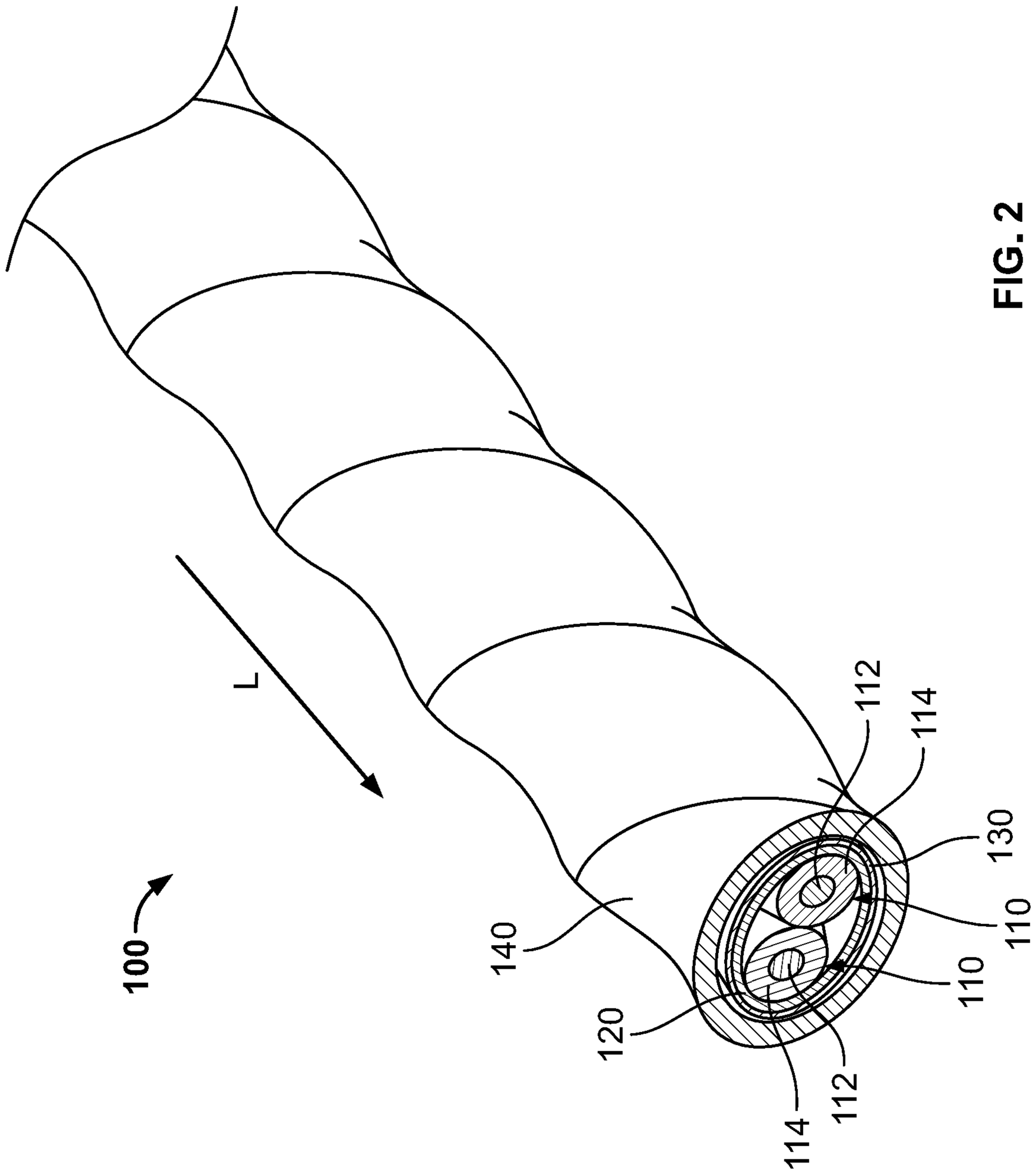


FIG. 2

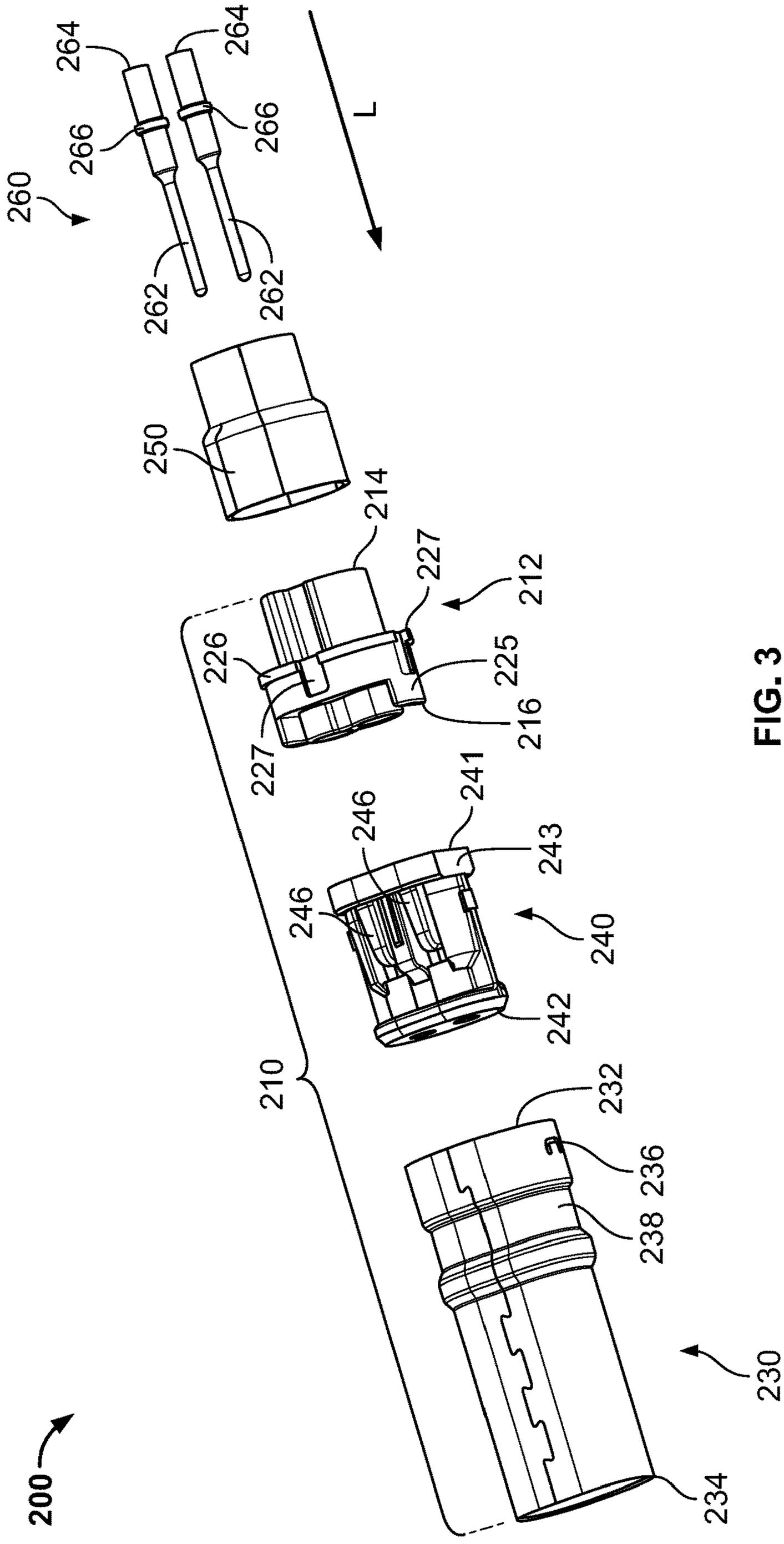

200
260
264
264
266
266
262
262
L
250
214
227
212
226
225
216
227
241
246
243
246
240
242
210
232
236
238
230
234

FIG. 3

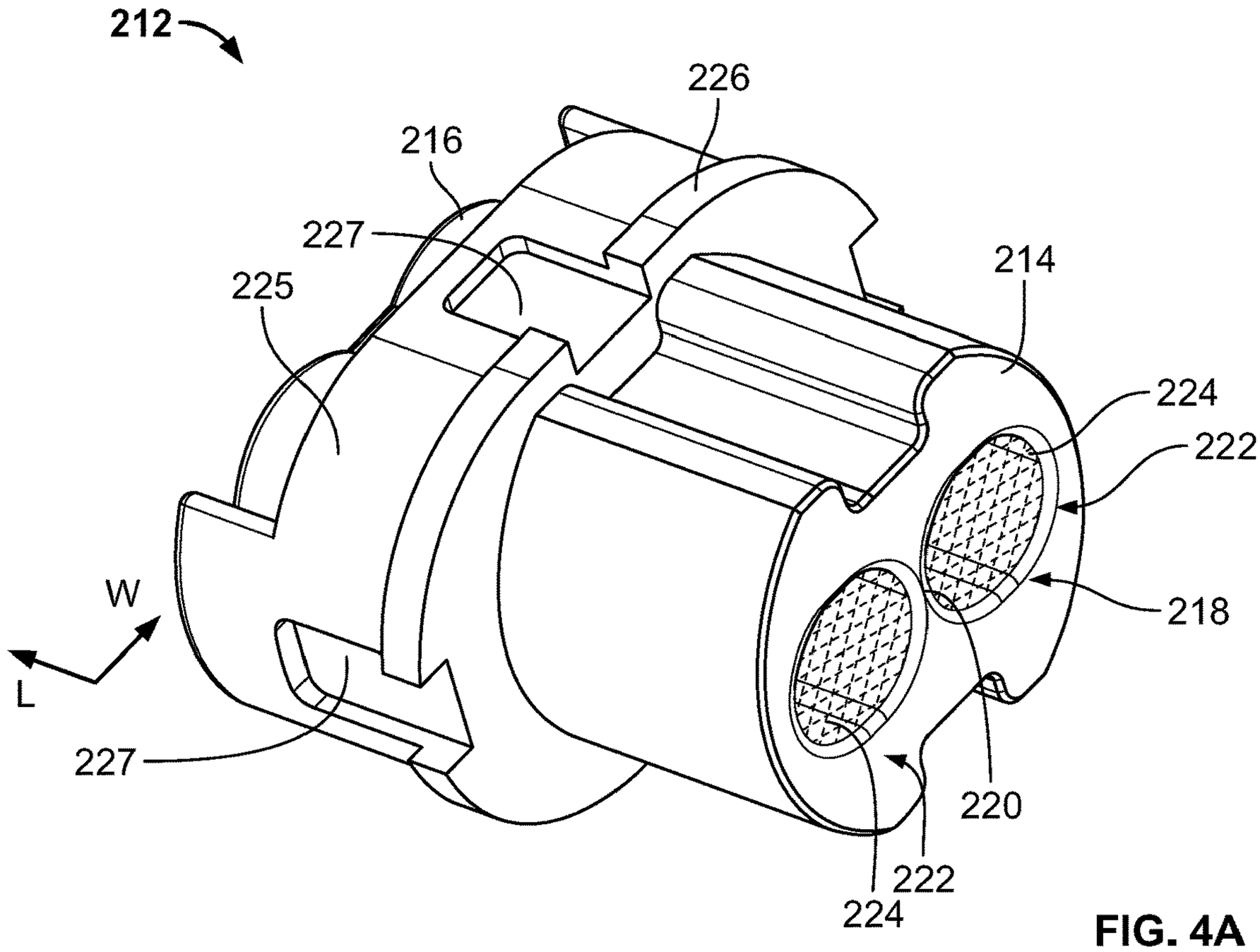

212
226
216
227
225
214
224
222
218
W
L
227
220
222
224

FIG. 4A

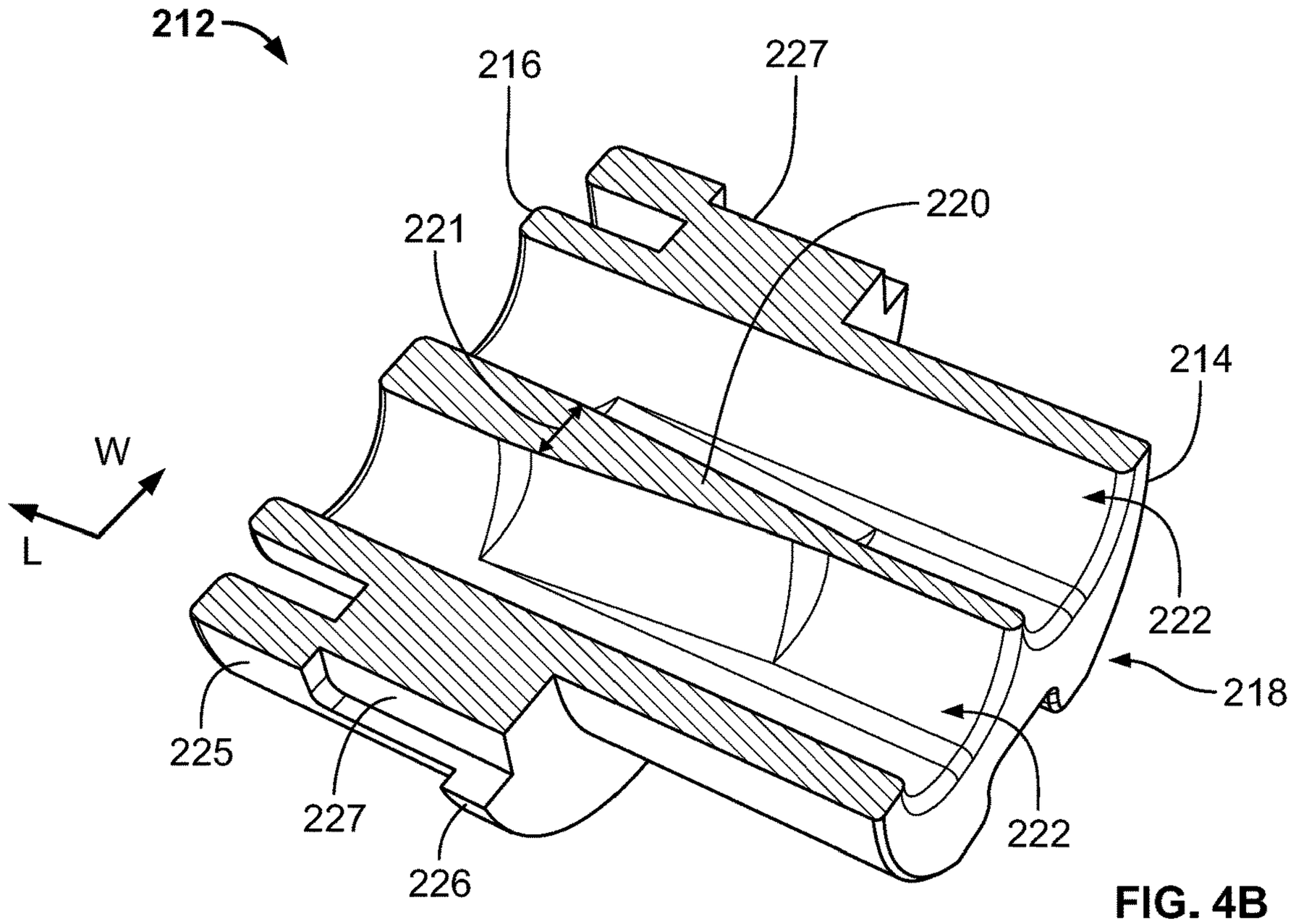

212
216
227
221
220
214
W
L
222
218
225
227
226
222

FIG. 4B

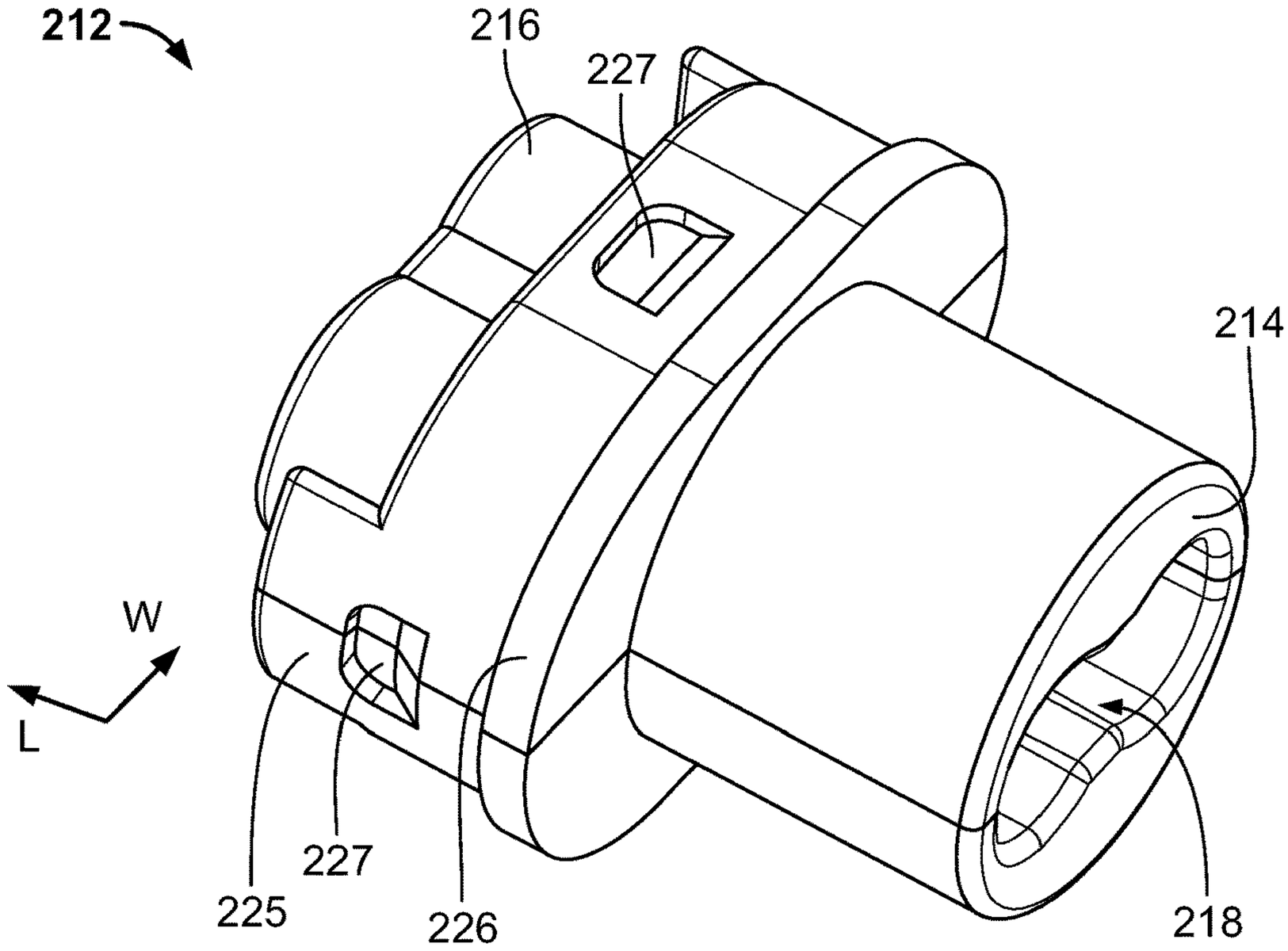

212
216
227
214
W
L
225
227
226
218

FIG. 5A

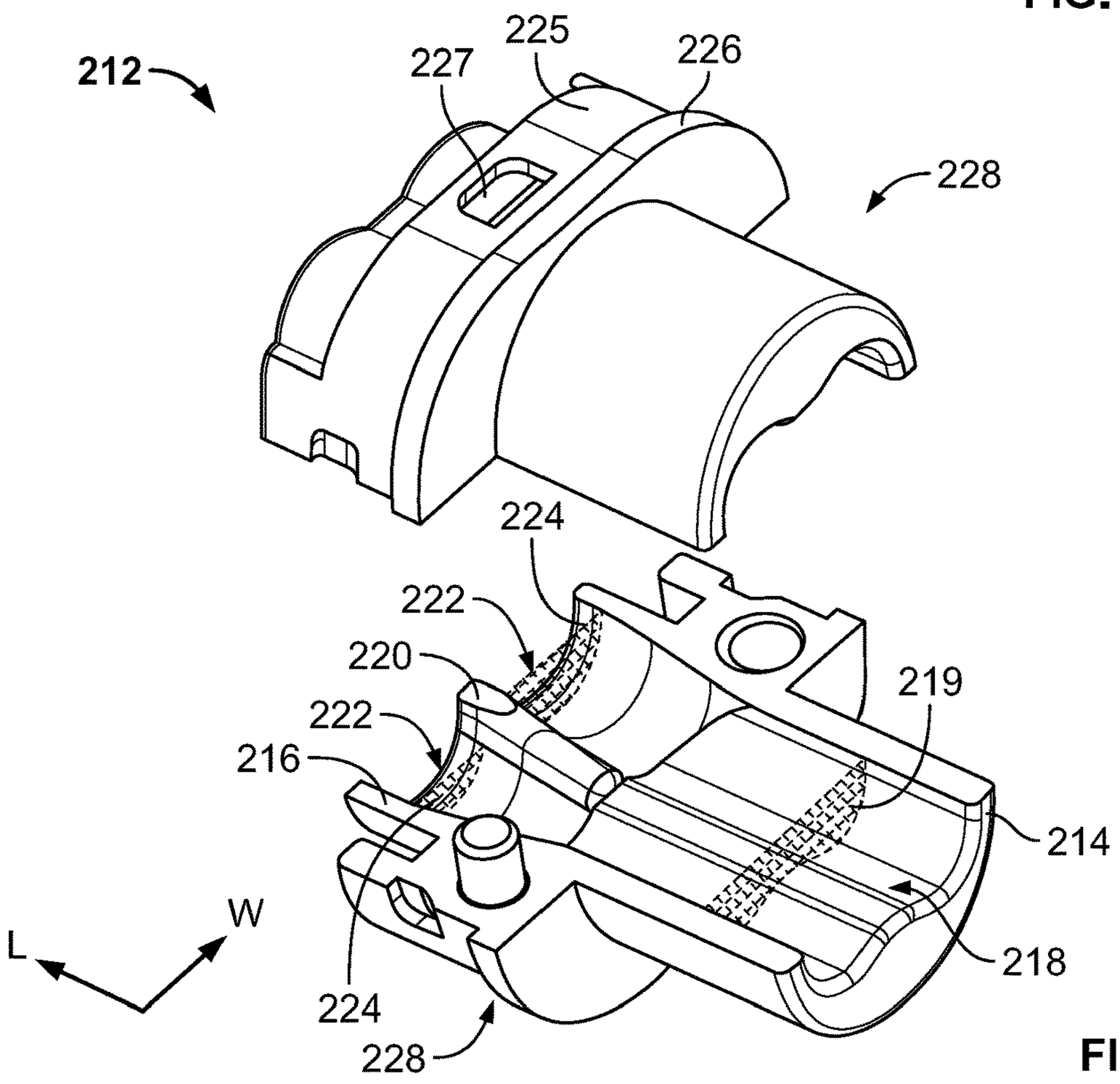

212
227
225
226
228
224
222
220
222
216
219
214
218
W
L
224
228

FIG. 5B

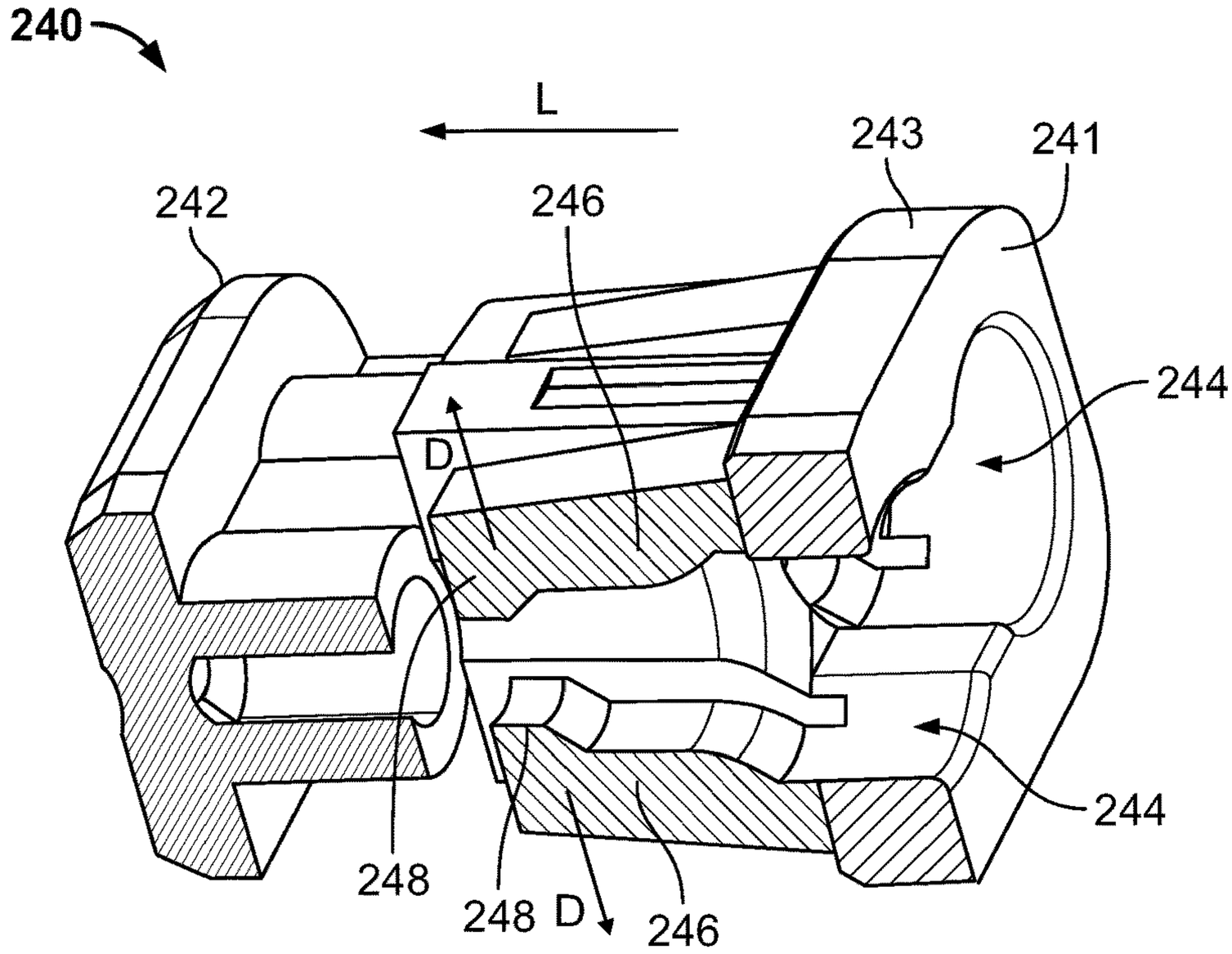

240
L
243
241
242
246
244
D
248
248
D
246
244

FIG. 6

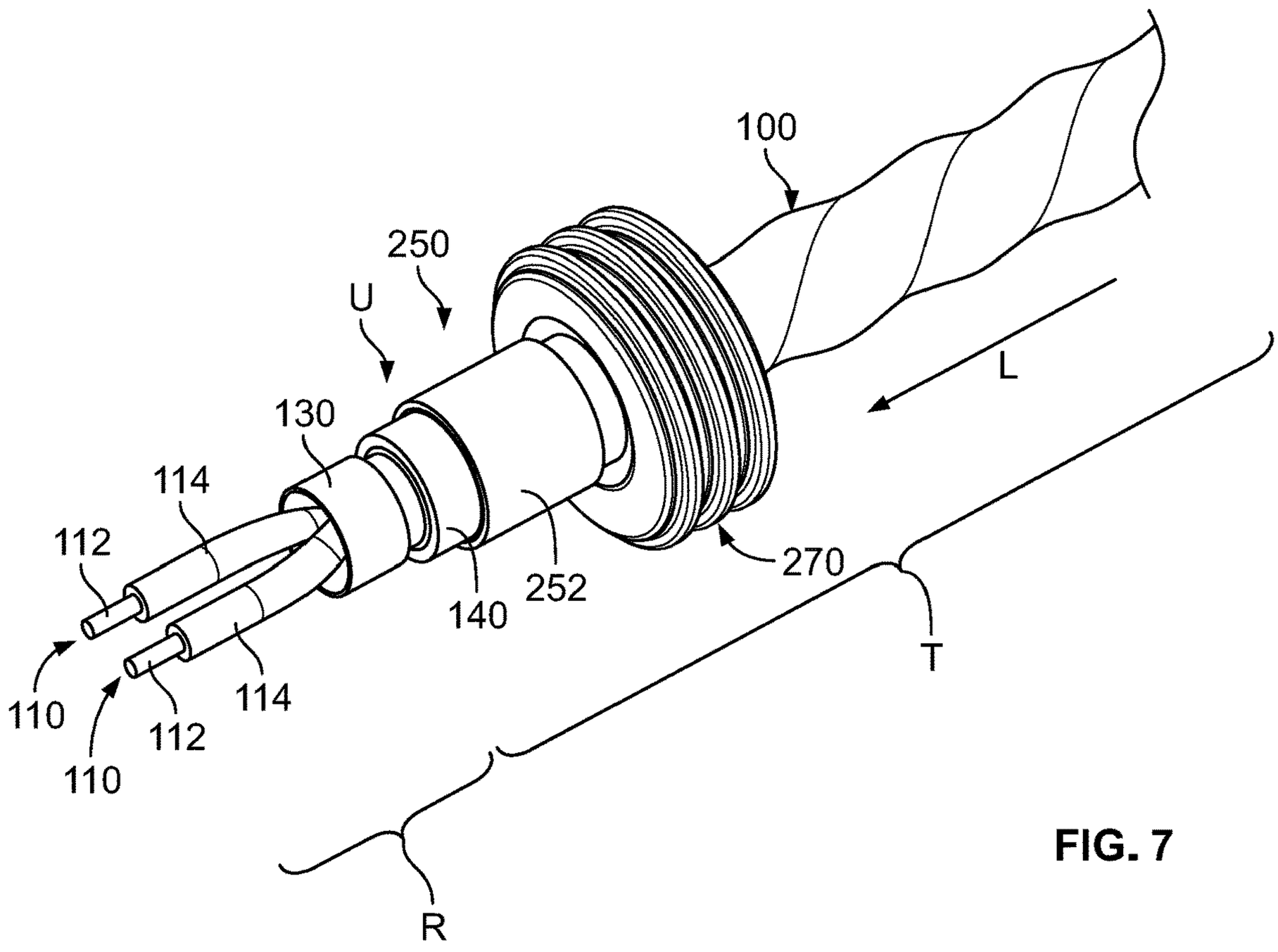

100
250
U
L
130
114
112
110
110
112
114
140
252
270
T
R

FIG. 7

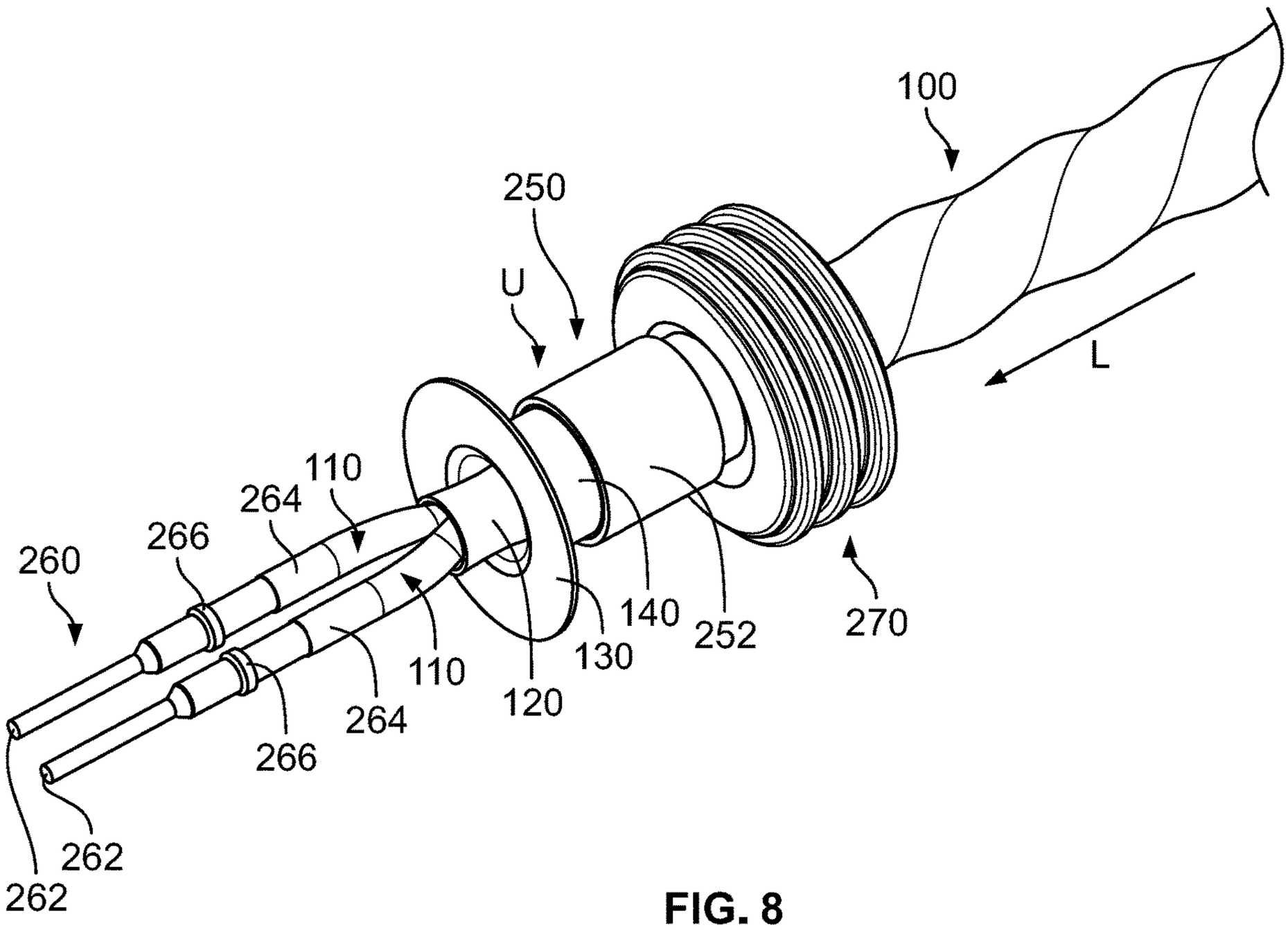

100
250
U
L
110
264
266
260
140
252
270
130
120
110
264
266
262
262

FIG. 8

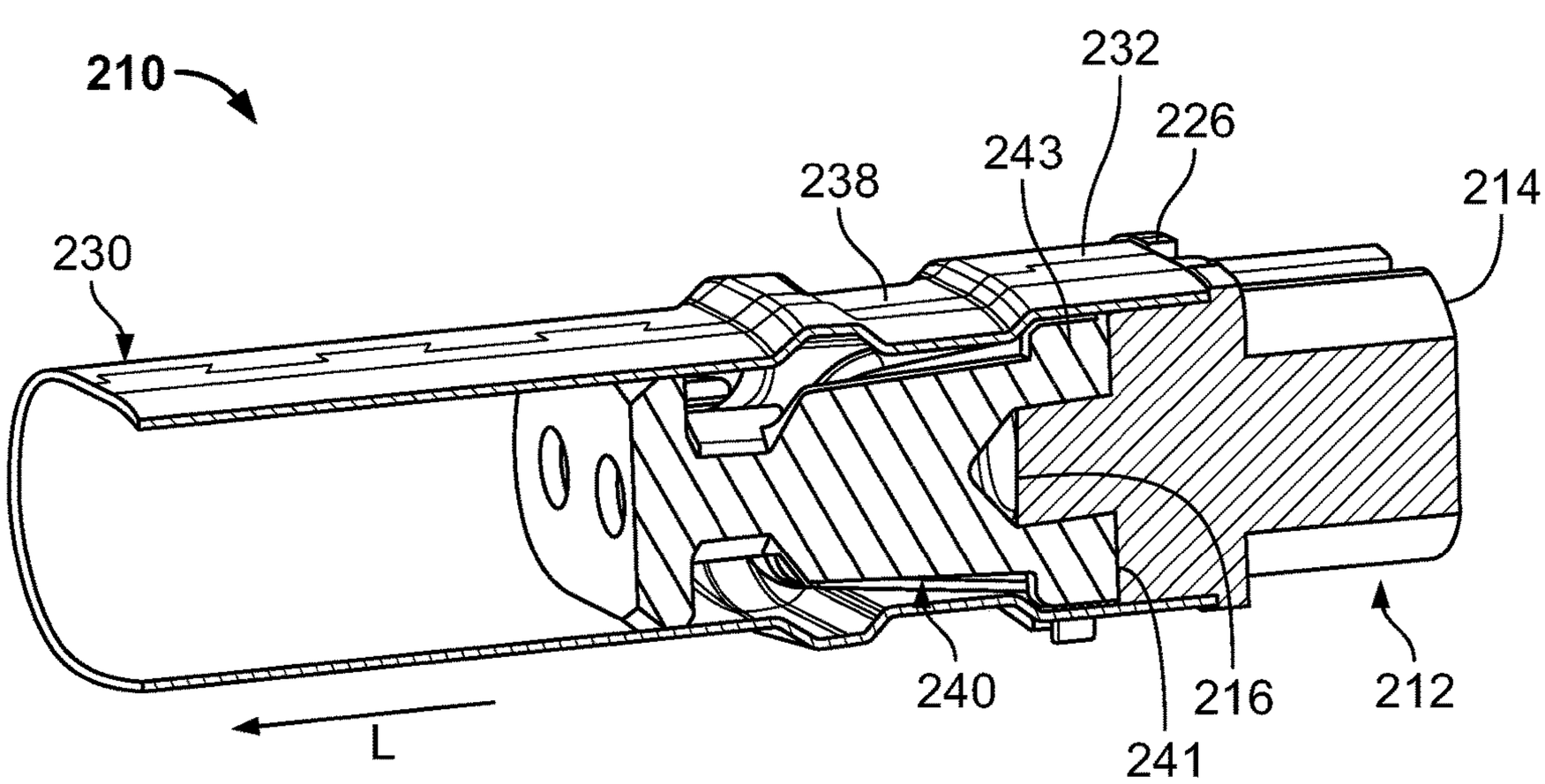

210
232
226
243
238
214
230
240
216
212
241
L

FIG. 9

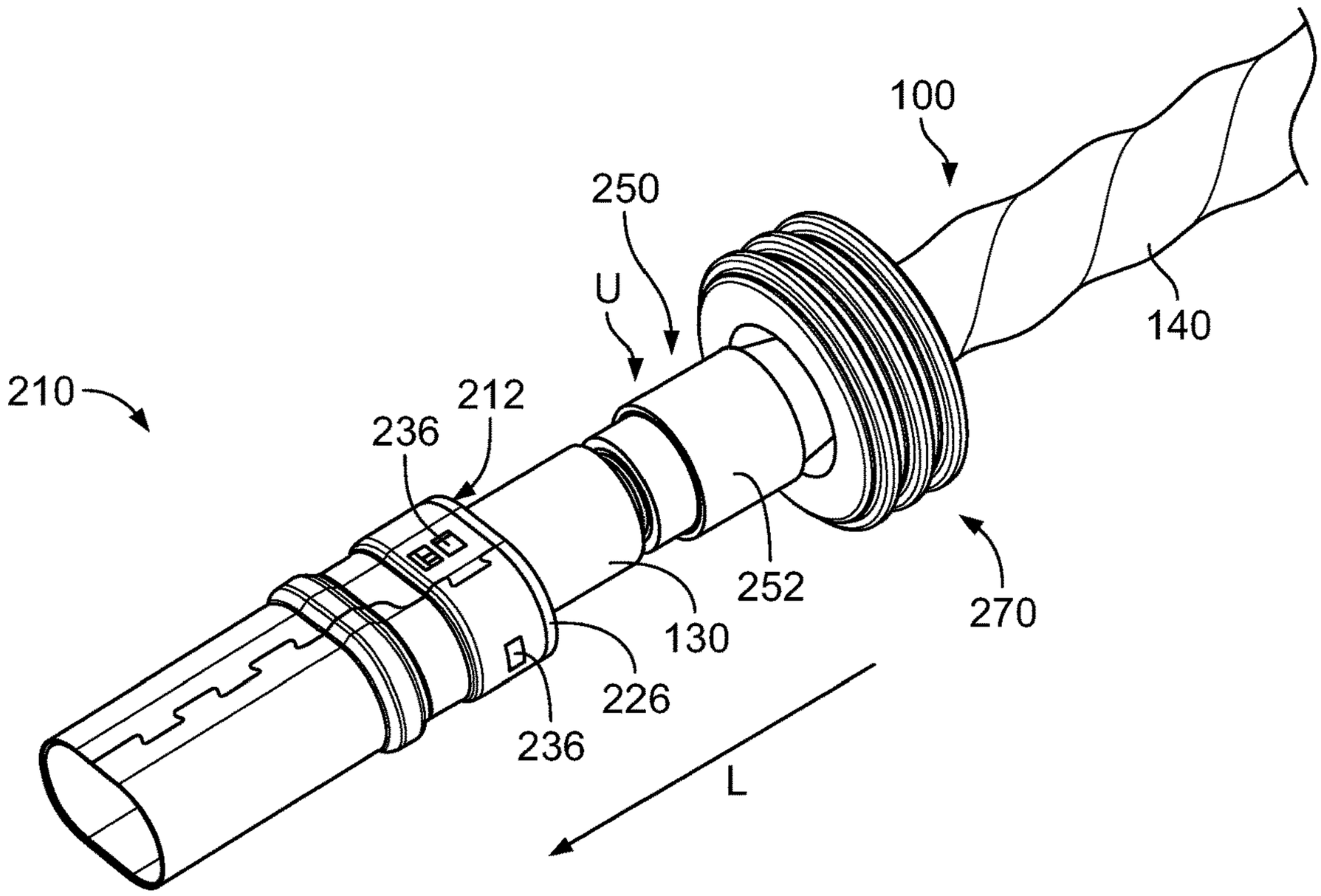

100
250
U
140
210
212
236
252
270
130
226
236
L

FIG. 10

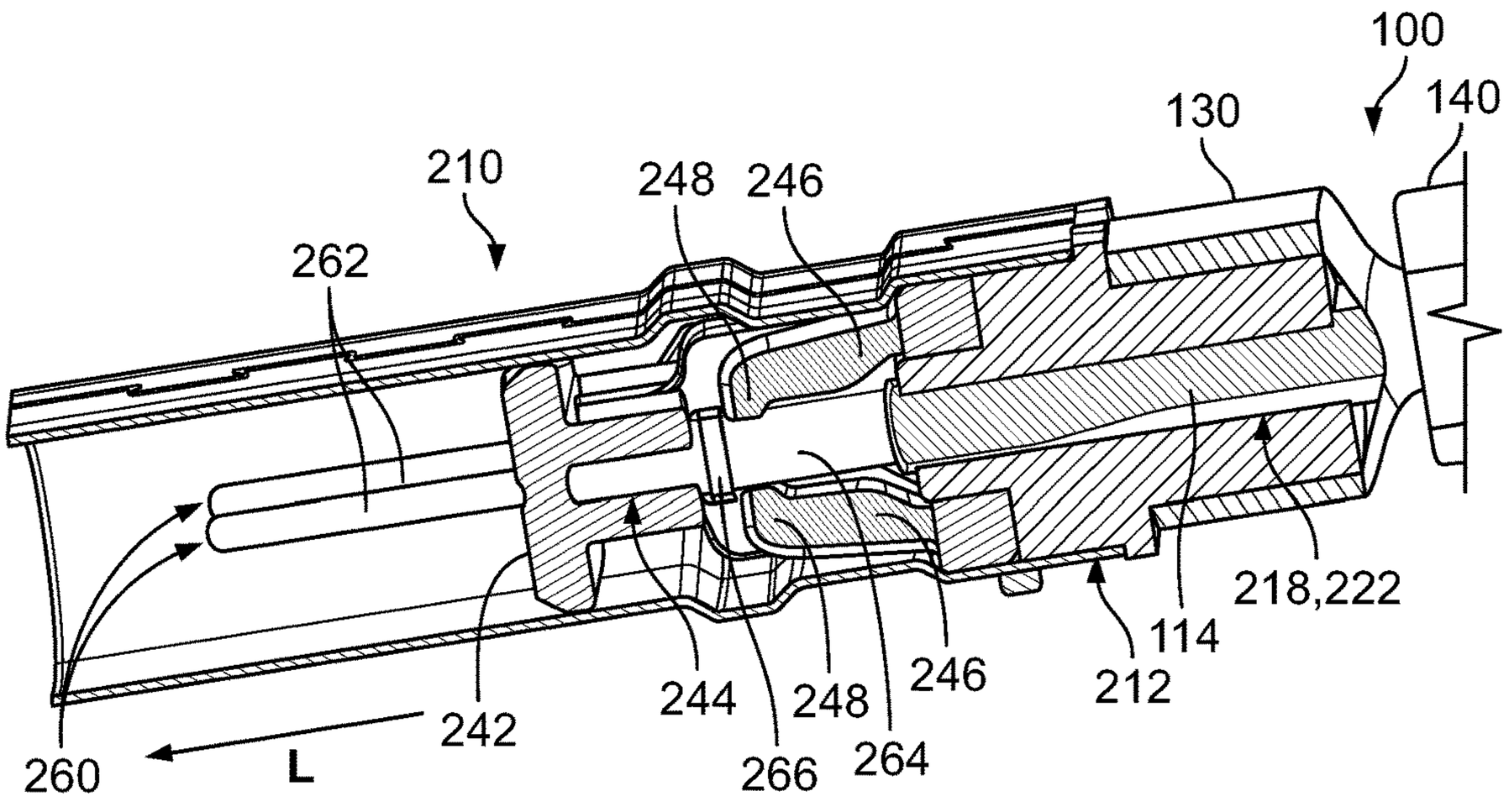

100
130
140
210
248
246
262
218,222
114
212
242
244
248
246
260
L
266
264

FIG. 11

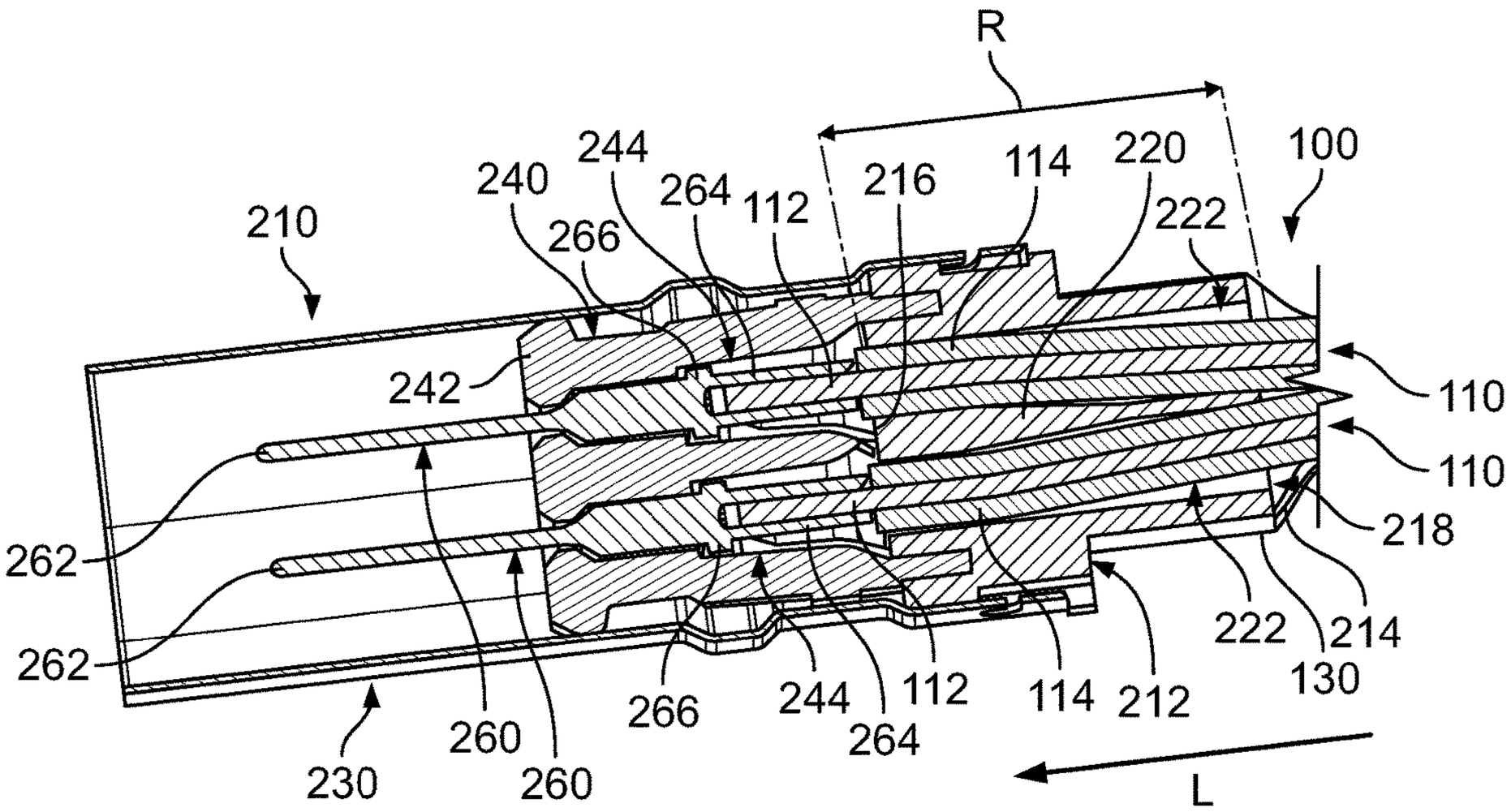

R
210
240
244
264
112
216
114
220
100
266
222
242
110
110
218
262
262
222
214
130
212
114
112
244
266
264
260
260
230
L

FIG. 12

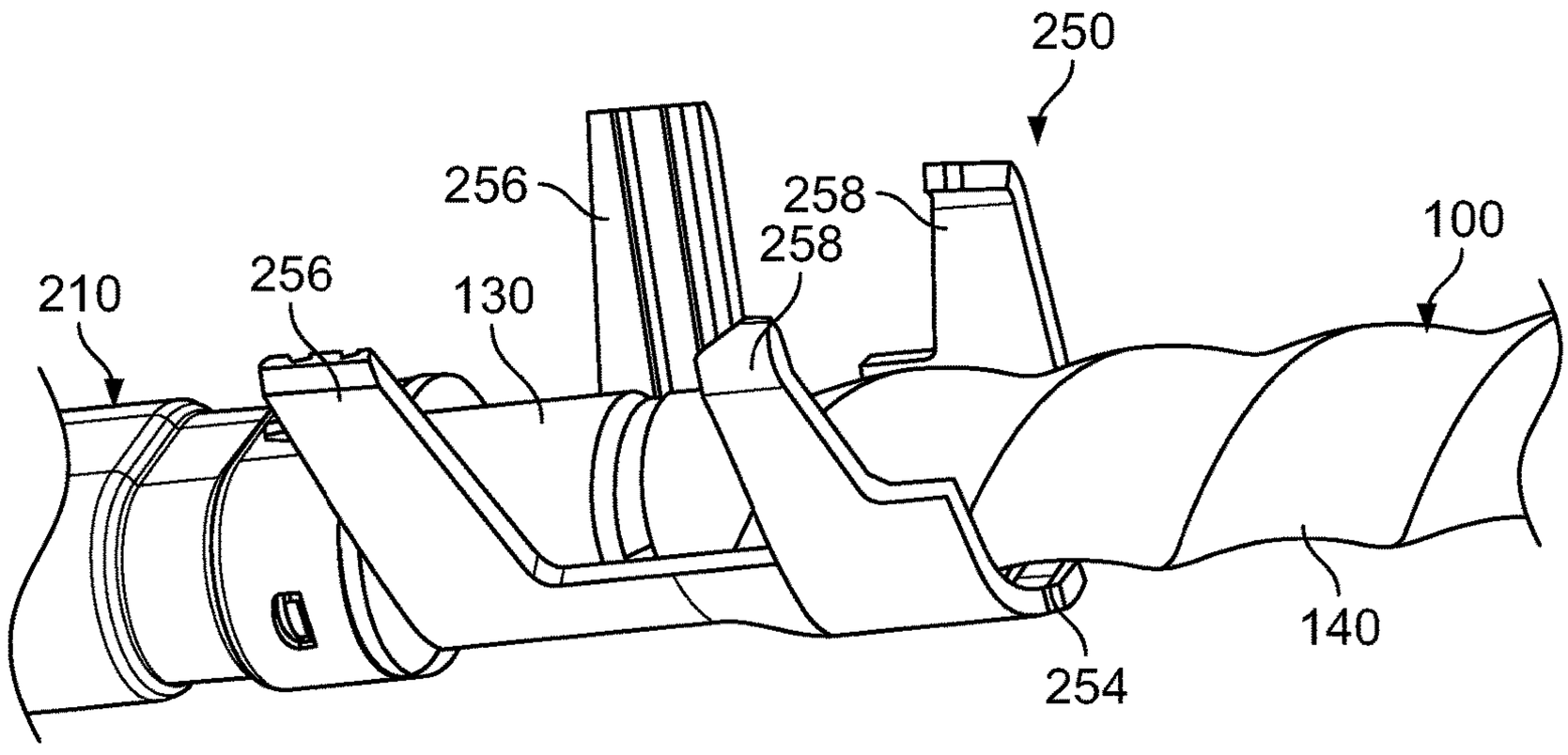

250
256
258
258
100
210
256
130
140
254

FIG. 13

CABLE HARNESS ASSEMBLY WITH A SHIELDED TWISTED PAIR CABLE

FIELD OF THE INVENTION

The present invention relates to a cable harness assembly and, more particularly, to a cable harness assembly with a shielded twisted pair cable.

BACKGROUND

A connector assembly is secured to a shielded twisted pair cable in order to permit separable electrical connection of the shielded twisted pair cable to other electrical elements. The connector assembly often includes a housing and a ferrule that is used to prevent movement of the cable with respect to the housing. The ferrule, however, is often the only element that secures both the components of the housing together and the cable to the housing, increasing difficulty in assembly and in servicing a cable harness assembly formed by the connector assembly and the cable. Further, the shielded twisted pair cable is untwisted inside the housing to connect to the other electrical elements, complicating control of the impedance of the cable.

SUMMARY

A cable harness assembly includes a cable having a pair of wires and a connector assembly including an inner ferrule formed of a conductive material. Each of the wires has a conductor and a insulation disposed around the conductor. The pair of wires have a twisted region and an untwisted region. The inner ferrule has a cable passageway extending through the inner ferrule and a separator disposed within the cable passageway. The untwisted region is disposed in the inner ferrule and the separator is disposed between the wires in the untwisted region.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of example with reference to the accompanying Figures, of which:

FIG. **1** is a perspective view of a cable harness assembly according to an embodiment;

FIG. **2** is a perspective view of a cable of the cable harness assembly;

FIG. **3** is an exploded perspective view of a connector assembly of the cable harness assembly;

FIG. **4**A is a perspective view of an inner ferrule of the connector assembly according to an embodiment;

FIG. **4**B is a sectional perspective view of the inner ferrule of FIG. **4**A;

FIG. **5**A is a perspective view of an inner ferrule of the connector assembly according to another embodiment;

FIG. **5**B is an exploded perspective view of the inner ferrule of FIG. **5**A;

FIG. **6** is a sectional perspective view of a housing of the connector;

FIG. **7** is a perspective view of the cable with an outer ferrule and a seal;

FIG. **8** is a perspective view of the cable with a pair of inner contacts;

FIG. **9** is a sectional perspective view of a connector of the cable harness assembly including the inner ferrule, the housing, and an outer contact;

FIG. **10** is a perspective view of the cable attached to the connector;

FIG. **11** is a sectional side perspective view of the cable attached to the connector;

FIG. **12** is a sectional top perspective view of the cable attached to the connector; and

FIG. **13** is a perspective view of the cable attached to the connector with an outer ferrule according to another embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Exemplary embodiments of the present disclosure will be described hereinafter in detail with reference to the attached drawings, wherein like reference numerals refer to like elements. The present disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, these embodiments are provided so that the present disclosure will convey the concept of the disclosure to those skilled in the art. In addition, in the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. However, it is apparent that one or more embodiments may also be implemented without these specific details.

A cable harness assembly **10** according to an embodiment, as shown in FIG. **1**, comprises a cable **100** and a connector assembly **200** connected to the cable **100**. In the exemplary embodiment described herein, the cable harness assembly **10** is a plug and the connector assembly **200** is a plug connector assembly. In other embodiments, the cable harness assembly **10** may be a receptacle and the connector assembly **200** may be a receptacle connector assembly; the principles of the present disclosure apply to both plug and receptacle arrangements.

The cable **100**, as shown in FIGS. **1** and **2**, is a shielded twisted pair (STP) cable. The cable **100** includes a pair of wires **110** twisted around one another in a helix shape along a longitudinal direction L, a braided shield **130** disposed around and surrounding the pair of wires **110**, and an outer insulative jacket **140** disposed around and surrounding the braided shield **130**. In the shown embodiment, an inner insulative jacket **120** is disposed around and surrounding the pair of wires **110**, and the braided shield **130** is disposed around and surrounding the inner insulative jacket **120**. In another embodiment, the inner insulative jacket **120** may be omitted. In another embodiment, the cable **100** may include a foil wrapping disposed under the braided shield **130**, around and surrounding the pair of wires **110**.

Each of the wires **110**, as shown in FIG. **2**, has a conductor **112** and an insulation **114** disposed around and surrounding the conductor **112**. The conductor **112** of each of the wires **110** and the braided shield **130** are formed of a conductive material, such as copper, aluminum, or other conductive materials used in electrical cables. The insulation **114** of each of the wires **110**, the inner insulative jacket **120**, and the outer insulative jacket **140** are each formed of an insulative material, such as rubber, polyethylene, silicon, or other forms of insulation used with conductive wires.

The connector assembly **200**, as shown in FIGS. **1** and **3**, includes a connector **210**, an outer ferrule **250** disposed around a portion of the connector **210**, and a pair of inner contacts **260** disposed within the connector **210**.

The connector **210**, as shown in FIG. **3**, includes an inner ferrule **212**, an outer contact **230** attachable to the inner ferrule **212**, and a housing **240** attachable to the inner ferrule **212** and the outer contact **230**. A first embodiment of the

inner ferrule **212** is shown in FIGS. **3**, **4**A, and **4**B, and a second embodiment of the inner ferrule **212** is shown in FIGS. **5**A and **5**B.

The inner ferrule **212**, as shown in the embodiment of FIGS. **3**, **4**A, and **4**B, has a first end **214** and a second end **216** opposite the first end **214** in the longitudinal direction L. The inner ferrule **212** has a cable passageway **218** extending through the inner ferrule **212** in the longitudinal direction L from the first end **214** to the second end **216**. A separator **220** disposed in the cable passageway **218** separates the cable passageway **218** into a pair of individual wire passageways **222**. In the embodiment shown in FIGS. **3**, **4**A, and **4**B, the inner ferrule **212** is monolithically formed in a single piece from a conductive material.

In the embodiment shown in FIGS. **3**, **4**A, and **4**B, the separator **220** extends along an entirety of the cable passageway **218** from the first end **214** to the second end **216**. The separator **220** has a thickness **221** in a width direction W perpendicular to the longitudinal direction L. In the shown embodiment, the thickness **221** increases from the first end **214** to the second end **216**; the thickness **221** is at a minimum at the first end **214** and is at a maximum at the second end **216**. Due to the variation in the thickness **221** of the separator **220**, a cross-sectional area **224** of each of the individual wire passageways **222** decreases from the first end **214** to the second end **216**; the cross-sectional area **224** is at a maximum at the first end **214** and is at a minimum at the second end **216**. In another embodiment, the thickness **221** is constant along the length of the separator **220** in the longitudinal direction L, and the cross-sectional area **224** of each of the individual wire passageways **222** is constant along the longitudinal direction L. The individual wire passageways **222** are identical in the shown embodiment and have identical cross-sectional areas **224**.

The inner ferrule **212**, as shown in the embodiment of FIGS. **3**, **4**A, and **4**B, has an exterior surface **225** extending around the cable passageway **218**. The exterior surface **225** has a stop **226** protruding from the exterior surface **225** and a plurality of indents **227** extending into the exterior surface **225**.

An inner ferrule **212** according to another embodiment is shown in FIGS. **5**A and **5**B. Like reference numbers indicate like elements with respect to the embodiment shown in FIGS. **4**A and **4**B and only the differences of the embodiment shown in FIGS. **5**A and **5**B will be described in detail herein.

In the embodiment shown in FIGS. **5**A and **5**B, instead of the separator **220** extending along the entirety of cable passageway **218** from the first end **214** to the second end **216**, the separator **220** is disposed only at the second end **216** of the inner ferrule **212**. The cable passageway **218** in the embodiment shown in FIGS. **5**A and **5**B is not separated into the individual wire passageways **222** at the first end **214**, but rather is separated into the individual wire passageways **222** at a point along the longitudinal direction L close to the second end **216**. The cable passageway **218** has a cross-sectional area **219** at the first end **214** that is larger than the cross-sectional area **224** of each of the individual wire passageways **222** at the second end **216**.

In the embodiment shown in FIGS. **5**A and **5**B, instead of being monolithically formed in a single piece, the inner ferrule **212** is formed in a pair of halves **228** that are attachable to one another or matable together. Each of the halves **228**, as shown in FIG. **5**B, is monolithically formed in a single piece of a conductive material and has a portion of the cable passageway **218**, a portion of the separator **220**, and a portion of each of the individual wire passageways **222**. In the shown embodiment, the halves **228** are identical to one another. Attachment of the halves **228**, as shown in FIG. **5**A, forms the assembled inner ferrule **212**.

The features of the aforementioned embodiments of the inner ferrule **212** shown in FIGS. **4**A-**5**B are interchangeable and combinable. For example, in another embodiment, the inner ferrule **212** may be monolithically formed in a single piece as in the embodiment of FIGS. **4**A and **4**B, instead of the pair of halves **228** of the embodiment of FIGS. **5**A and **5**B, yet may have the separator **220** disposed only at the second end **216** as in the embodiment of FIGS. **5**A and **5**B.

The outer contact **230**, as shown in FIGS. **1** and **3**, has a first end **232** and a second end **234** opposite the first end **232** in the longitudinal direction L. The outer contact **230** is formed of a conductive material and, in the shown embodiment, is formed by stamping and bending a single metal sheet into an approximately cylindrical shape. The outer contact **230** has a plurality of tabs **236** proximal to the first end **232** and a step **238** between the first end **232** and the second end **234**. The tabs **236** and the step **238**, in an embodiment, are formed by stamping. The step **238** is a portion of the outer contact **230** that is narrowed with respect to the first end **232**.

The housing **240**, as shown in FIGS. **3** and **6**, has a first end **241** and a second end **242** opposite the first end **241** in the longitudinal direction L. The housing **240** has a flange **243** at the first end **241** that forms a maximum outer dimension of the housing **240**. The housing **240** has a pair of terminal receiving passageways **244** extending through the housing **240** from the first end **241** to the second end **242**.

Each of the terminal receiving passageways **244**, in the embodiment shown in FIG. **6**, has a pair of opposite terminal retention latches **246** extending from the flange **243** into the terminal receiving passageway **244**. The terminal retention latches **246** are each formed as a cantilever with a fixed end at the flange **243** and are elastically deflectable along a deflection axis D perpendicular to the longitudinal direction L. Each of the terminal retention latches **246** has a latch protrusion **248** at a free end opposite the flange **243**. In other embodiments, each of the terminal receiving passageways **244** may only have one terminal retention latch **246** or may have a plurality of terminal retention latches **246** that are not opposite one another. In other embodiments, the terminal retention latches **246** may be components separate from the housing **240**.

In the shown embodiment, the housing **240** is monolithically formed in a single piece from an insulative material. In other embodiments, the components of the housing **240** described above may be formed separately and assembled together.

The outer ferrule **250** is monolithically formed in a single piece from a conductive material. The outer ferrule **250** is shown in a crimped state C in FIG. **1** and an uncrimped state U in FIGS. **7**, **8**, and **10**. In the embodiment shown in FIGS. **7**, **8**, and **10** the outer ferrule **250** is a cylindrical element **252** in the uncrimped state U. In other embodiments, the outer ferrule **250** may be a stepped extruded element or a flared element in the uncrimped state U.

The inner contacts **260** of the connector assembly **200**, as shown in FIGS. **3** and **8**, each have a pin section **262** and a crimp section **264** opposite the pin section **262** in the longitudinal direction L. The inner contacts **260** are each formed of a conductive material, such as copper, that is solid in the pin section **262** and hollow in the crimp section **264**. The inner contacts **260** each have a shoulder **266** protruding outward and circumferentially around the inner contact **260** between the pin section **262** and the crimp section **264**. In the

shown embodiment, the inner contacts **260** are each monolithically formed in a single piece. In other embodiments, the components of the inner contacts **260** described herein may be formed separately and assembled together. In other embodiments, the inner contacts **260** may each have a socket section in place of the pin section **262**.

A process of assembling the cable harness assembly **10** will now be described in greater detail primarily with reference to FIGS. **7-11**.

As shown in FIG. **7**, the cable **100** is prepared. From the state shown in FIG. **2**, a portion of the outer insulative jacket **140** is stripped to expose the braided shield **130**, a portion of the braided shield **130** is stripped to expose the pair of wires **110**, and a portion of the insulation **114** of each of the pair of wires **110** is stripped to expose the conductor **112** of each of the wires **110**. As an STP cable **100**, the wires **110** are twisted around one another in the helix shape along the longitudinal direction L in a twisted region T. At an end of the cable **100** at which the conductors **112** are exposed, the wires **110** are separated from one another to form an untwisted region R.

As shown in the embodiment of FIG. **7**, the outer ferrule **250** in the uncrimped state U is slid over the outer insulative jacket **140** in the longitudinal direction L and is positioned around the outer insulative jacket **140**. The outer ferrule **250** can be slid over the outer insulative jacket **140** either before or after the cable **100** is stripped.

In the embodiment shown in FIG. **7**, the cable harness assembly **10** includes a seal **270** that is also slid over the outer insulative jacket **140** in the longitudinal direction L and is positioned around the outer insulative jacket **140**. The seal **270** may be formed of an elastomeric material that can be deflected to seal between an outer surface of the outer insulative jacket **140** and, for example, a further housing (not shown) of the cable harness assembly **10**. The seal **270** is slid over the outer insulative jacket **140** before the outer ferrule **250**, but can be slid over the outer insulative jacket **140** before or after the cable **100** is stripped.

After the cable **100** is stripped and the outer ferrule **250** and the seal **270** are disposed over the outer insulative jacket **140**, the inner contacts **260** are electrically connected and secured to the conductors **112** of the wires **110** as shown in FIG. **8**. In the embodiment shown in FIG. **8**, the crimp section **264** of each of the inner contacts **260** is crimped to one of the conductors **112**. In other embodiments, the inner contacts **260** could be secured and electrically connected to the conductors **112** by other forms of connection, such as a press-fit or a soldered connection. As shown in FIG. **8**, the portion of the braided shield **130** exposed from the outer insulative jacket **140** is flared.

Before or after the preparation of the cable **100** shown in FIGS. **7** and **8**, the connector **210** of the connector assembly **200** is assembled as shown in FIG. **9**. From the state shown in FIG. **3**, the first end **241** of the housing **240** is inserted over the second end **216** of the inner ferrule **212** as shown in FIG. **9**. The outer contact **230** is then inserted in the longitudinal direction L over the housing **240** until the first end **232** of the outer contact **230** contacts the stop **226** of the inner ferrule **212**.

The tabs **236**, in the embodiment shown in FIGS. **1** and **10**, are bent into engagement with the indents **227** on the exterior surface **225** of the inner ferrule **212**, attaching the outer contact **230** to the inner ferrule **212**. In another embodiment, the tabs **236** are bent prior to insertion of the outer contact **230** over the housing **240** and the inner ferrule **212**, elastically deflecting during the insertion and elastically engaging the indents **227**.

The outer contact **230** and the inner ferrule **212** are electrically connected to one another in the assembled state of the connector **210** shown in FIG. **9**. As shown in FIG. **9**, the flange **243** is positioned between the step **238** of the outer contact **230** and the inner ferrule **212** with the outer contact **230** attached to the inner ferrule **212**. The step **238** holds the housing **240** in place on the second end **216** of the inner ferrule **212**.

In the assembled state shown in FIG. **9**, the inner ferrule **212**, the outer contact **230**, and the housing **240** are attachable together to form the connector **210** as an independent element. The connector **210** is attached and secured together independently of any attachment to other elements, such as the cable **100**. The assembled state shown in FIG. **9** and the attachment described above applies for both the embodiment of the inner ferrule **212** shown in FIGS. **4**A and **4**B and the embodiment of the inner ferrule **212** shown in FIGS. **5**A and **5**B.

With the connector **210** in the assembled state shown in FIG. **9** and the cable **100** prepared as shown in FIG. **8**, the cable **100** with the crimped inner contacts **260** is inserted into the connector **210** along the longitudinal direction L as shown in FIGS. **10-12**.

As shown in FIGS. **11** and **12**, the inner contacts **260** are inserted through the cable passageway **218**, including the individual wire passageways **222**, of the inner ferrule **212** and into the terminal receiving passageways **244** of the housing **240**. Each of the inner contacts **260** is positioned in one of the terminal receiving passageways **244**. Each of the inner contacts **260** is inserted into one of the terminal receiving passageways **244** until the shoulder **266** contacts the terminal retention latches **246** and deflects the terminal retention latches **246** outward along the deflection axis D as shown in FIG. **6**. As the inner contacts **260** continue to move along the longitudinal direction L, the shoulder **266** passes the latch protrusion **248** of each of the terminal retention latches **246**, and the terminal retention latches **246** elastically return along the deflection axis D to the position shown in FIG. **11**.

As shown in FIG. **11**, each of the inner contacts **260** is held in one of the terminal receiving passageways **244** with the latch protrusion **248** abutting a side of the shoulder **266** in the longitudinal direction L. The inner contacts **260** simultaneously engage the terminal retention latches **246** to secure the cable **100** to the housing **240** and within the inner ferrule **212**. The crimp section **264** is positioned between the terminal retention latches **246** and the pin section **262** protrudes from the front end **242** of the housing **240**. As the inner contacts **260** are held within the connector **210** by the terminal retention latches **246**, and the crimp section **264** of each of the inner contacts **260** is crimped to one of the conductors **112** as shown in FIG. **12**, the securing of the inner contacts **260** in the connector **210** also secures the cable **100** to the connector **210** prior to crimping of the outer ferrule **250** described below. This initial securing of the cable **100** to the connector **210** eases manufacturability and serviceability of the cable harness assembly **10**.

As shown in FIG. **12**, when the inner contacts **260** are fully inserted into the terminal receiving passageways **244**, the untwisted region R of the wires **110** is disposed in the inner ferrule **212**. The separator **220** is disposed between the wires **110** in the untwisted region R and each of the wires **110** is disposed in one of the individual wire passageways **222**. The inner ferrule **212** surrounds the cable **100** in the untwisted region R, and the inner ferrule **212** with the separator **220** individually surrounds each of the wires **110** at least at the second end **216** of the inner ferrule **212**. In the

embodiment of the inner ferrule **212** shown in FIG. **12**, which is the inner ferule **212** of FIGS. **4**A and **4**B, the inner ferrule **212** with the separator **220** individually surrounds each of the wires **110** from an entirety of the first end **214** to the second end **216** of each of the wires **110** along the longitudinal direction L. The separator **220** and the surrounding of the wires **110** with the inner ferrule **212** improves control of an impedance in the untwisted region R.

With the cable **100** and the inner contacts **260** latched to the connector **210**, the braided shield **130** that was flared as shown in FIG. **8** is positioned around the inner ferrule **212**, as shown in FIGS. **10-12**.

In the embodiment shown in FIG. **10**, with the braided shield **130** positioned around the inner ferrule **212**, the outer ferrule **250** formed as the cylindrical element **252** is slid along the longitudinal direction L over the braided shield **130** into abutment with the stop **226**. The outer ferrule **250** is crimped around the braided shield **130** and the inner ferrule **212** to the crimped state C shown in FIG. **1**, further securing the braided shield **130** and the cable **100** to the inner ferrule **212**. The braided shield **130** is held between the inner ferrule **212** and the outer ferrule **250** and is electrically connected to the inner ferrule **212**.

An outer ferrule **250** according to another embodiment, as shown in FIG. **13**, includes a base **254**, a pair of conductor crimp wings **256** extending from opposite sides of the base **254**, and a pair of insulation crimp wings **258** extending from opposite sides of the base **254**. The outer ferrule **250** in the embodiment of FIG. **13** is monolithically formed in a single piece from a conductive material.

The outer ferrule **250** in the embodiment of FIG. **13**, contrary to the outer ferrule **250** of the embodiment of FIG. **10**, does not need to be slid over the outer insulative jacket **140** prior to attachment of the cable **100** to the connector **210**. Instead, with the cable **100** and the inner contacts **260** latched to the connector **210** and the braided shield **130** positioned around the inner ferrule **212**, the outer ferrule **250** of FIG. **13** can be then moved into position and crimped, which eases manufacturability and serviceability of the cable harness assembly **10**. The conductor crimp wings **256** are crimped around the braided shield **130** and the inner ferrule **212** to hold the braided shield **130** between the inner ferrule **212** and the outer ferrule **250**. The insulation crimp wings **258** are crimped around the outer insulative jacket **140** to further secure the outer ferrule **250** to the cable **100** and the connector **210**.

What is claimed is:

1. A cable harness assembly, comprising:

a cable having a pair of wires, each of the wires having a conductor and an insulation disposed around the conductor, the pair of wires have a twisted region and an untwisted region; and

a connector assembly including an inner ferrule formed of a conductive material, the inner ferrule having a cable passageway extending through the inner ferrule and a separator disposed within the cable passageway, the untwisted region is disposed in the inner ferrule and the separator is disposed between the wires in the untwisted region, the inner ferrule with the separator individually surrounds each of the wires in the untwisted region.

2. The cable harness assembly of claim **1**, wherein the inner ferrule has a first end and a second end, the separator is positioned at the second end and separates the cable passageway into a pair of individual wire passageways, each of the wires is disposed in one of the individual wire passageways.

3. The cable harness assembly of claim **2**, wherein the separator extends from the first end of the inner ferrule to the second end of the inner ferrule.

4. The cable harness assembly of claim **2**, wherein each of the individual wire passageways at the second end has a cross-sectional area smaller than the cable passageway at the first end.

5. The cable harness assembly of claim **1**, wherein the inner ferrule is monolithically formed in a single piece or in a pair of halves attachable to one another.

6. The cable harness assembly of claim **1**, wherein the connector assembly includes an outer ferrule crimped over the inner ferrule.

7. The cable harness assembly of claim **6**, wherein the cable has a braided shield disposed around the pair of wires, the braided shield is held between the inner ferrule and the outer ferrule.

8. The cable harness assembly of claim **7**, wherein the cable has an outer insulative jacket disposed around the braided shield, the outer ferrule is positionable around the outer insulative jacket in an uncrimped state.

9. The cable harness assembly of claim **7**, wherein the outer ferrule has a base and a pair of conductor crimp wings extending from the base, the conductor crimp wings are crimped around the braided shield and the inner ferrule.

10. The cable harness assembly of claim **9**, wherein the cable has an outer insulative jacket disposed around the braided shield and the outer ferrule has a pair of insulation crimp wings extending from the base, the insulation crimp wings are crimped around the outer insulative jacket.

11. The cable harness assembly of claim **1**, wherein the connector assembly includes a housing formed of an insulative material and attached to the inner ferrule.

12. The cable harness assembly of claim **11**, wherein the connector assembly includes a pair of inner contacts, each of the inner contacts is crimped to the conductor of one of the wires, the inner contacts are inserted through the inner ferrule into the housing.

13. The cable harness assembly of claim **12**, wherein the housing has a plurality of terminal retention latches, the inner contacts simultaneously engage the terminal retention latches to secure the cable to the housing and within the inner ferrule.

14. The cable harness assembly of claim **11**, wherein the connector assembly includes an outer contact formed of a conductive material and attached to the inner ferrule, the inner ferrule, the housing, and the outer contact are attachable together to form a connector independent of the cable.

15. A method of assembling a cable harness assembly, comprising:

providing a cable having a pair of wires and a braided shield disposed around the pair of wires, each of the wires having a conductor, an insulation disposed around the conductor, and an inner contact crimped to the conductor, the pair of wires have a twisted region and an untwisted region;

providing a connector including an inner ferrule attached to a housing, the housing having a plurality of terminal retention latches;

inserting the inner contact of each of the wires through the inner ferrule into the housing, the inner contacts simultaneously engage the terminal retention latches to secure the cable to the housing and the untwisted region within the inner ferrule; and

crimping an outer ferrule around the braided shield and the inner ferrule, the braided shield is held between the inner ferrule and the outer ferrule.

16. The method of claim 15, further comprising, prior to the inserting and crimping steps, sliding the outer ferrule over an outer insulative jacket of the cable disposed around the braided shield.

17. The method of claim 15, wherein the outer ferrule has a base and a pair of conductor crimp wings extending from the base, the conductor crimp wings are positioned around the braided shield and the inner ferrule and crimped in the crimping step after the inserting step.

18. The method of claim 15, wherein the connector includes an outer contact attached to the inner ferrule, the inner ferrule, the housing, and the outer contact are attachable together to form the connector prior to the inserting step.

19. The method of claim 15, wherein the inner ferrule has a cable passageway extending into a first end of the inner ferrule and a separator disposed within the cable passageway, the separator is disposed between the wires in the untwisted region.

20. A cable harness assembly, comprising:

a cable having a pair of wires, each of the wires having a conductor and a insulation disposed around the conductor, the pair of wires have a twisted region and an untwisted region; and

a connector assembly including an inner ferrule formed of a conductive material and an outer ferrule crimped over the inner ferrule, the inner ferrule having a cable passageway extending through the inner ferrule and a separator disposed within the cable passageway, the untwisted region is disposed in the inner ferrule and the separator is disposed between the wires in the untwisted region.

21. The cable harness assembly of claim 20, wherein the cable has a braided shield disposed around the pair of wires, the braided shield is held between the inner ferrule and the outer ferrule.

22. The cable harness assembly of claim 21, wherein the cable has an outer insulative jacket disposed around the braided shield, the outer ferrule is positionable around the outer insulative jacket in an uncrimped state.

23. The cable harness assembly of claim 21, wherein the outer ferrule has a base and a pair of conductor crimp wings extending from the base, the conductor crimp wings are crimped around the braided shield and the inner ferrule.

24. The cable harness assembly of claim 23, wherein the cable has an outer insulative jacket disposed around the braided shield and the outer ferrule has a pair of insulation crimp wings extending from the base, the insulation crimp wings are crimped around the outer insulative jacket.

25. A cable harness assembly, comprising:

a cable having a pair of wires, each of the wires having a conductor and a insulation disposed around the conductor, the pair of wires have a twisted region and an untwisted region; and

a connector assembly including an inner ferrule formed of a conductive material and a housing formed of an insulative material and attached to the inner ferrule, the inner ferrule having a cable passageway extending through the inner ferrule and a separator disposed within the cable passageway, the untwisted region is disposed in the inner ferrule and the separator is disposed between the wires in the untwisted region.

26. The cable harness assembly of claim 25, wherein the connector assembly includes a pair of inner contacts, each of the inner contacts is crimped to the conductor of one of the wires, the inner contacts are inserted through the inner ferrule into the housing.

27. The cable harness assembly of claim 26, wherein the housing has a plurality of terminal retention latches, the inner contacts simultaneously engage the terminal retention latches to secure the cable to the housing and within the inner ferrule.

28. The cable harness assembly of claim 25, wherein the connector assembly includes an outer contact formed of a conductive material and attached to the inner ferrule, the inner ferrule, the housing, and the outer contact are attachable together to form a connector independent of the cable.

29. A cable harness assembly, comprising:

a cable having a pair of wires, each of the wires having a conductor and a insulation disposed around the conductor, the pair of wires have a twisted region and an untwisted region; and

a connector assembly including an inner ferrule formed of a conductive material, the inner ferrule having a cable passageway extending through the inner ferrule and a separator disposed within the cable passageway, the untwisted region is disposed in the inner ferrule and the separator is disposed between the wires in the untwisted region, the inner ferrule has a first end and a second end, the separator is positioned at the second end and separates the cable passageway into a pair of individual wire passageways, each of the wires is disposed in one of the individual wire passageways, the separator extends from the first end of the inner ferrule to the second end of the inner ferrule.

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